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(54) Identity document

(57) Personal identification documents are fabricated by forming an electrographic toner image containing a visually verifiable feature of the authorized document holder, thermally transferring such image to a cover sheet and laminating the cover sheet to a core substrate.

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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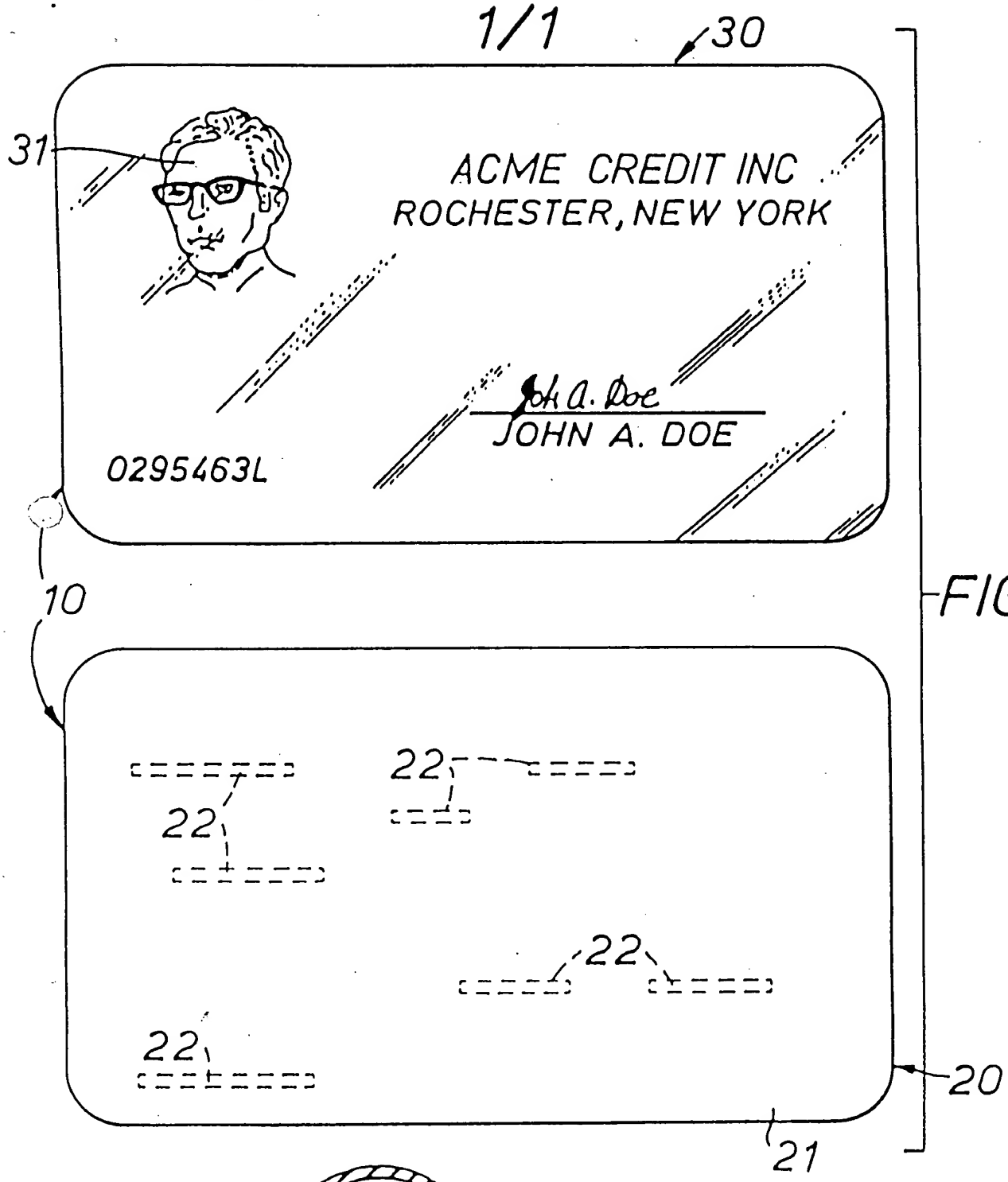
30
31
ACME CREDIT INC
ROCHESTER, NEW YORK
John A. Doe
JOHN A. DOE
0295463L
10
22
22
22
22
20
21

FIG.1.

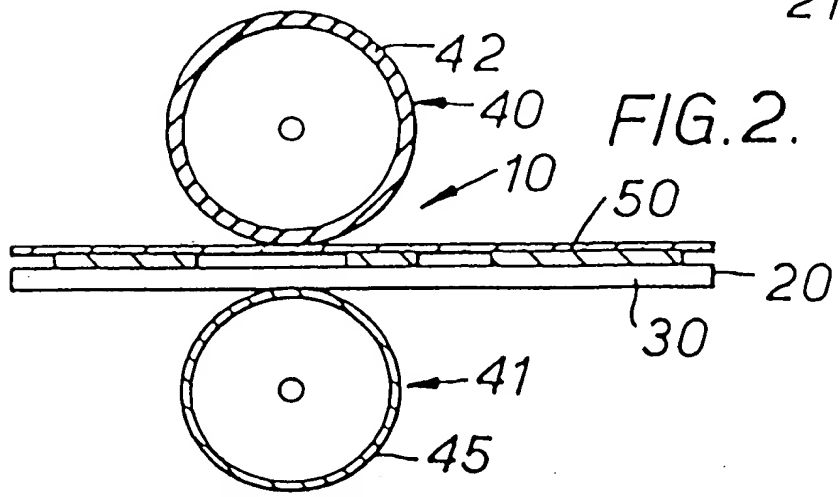
42
40
10
50
20
30
41
45

FIG.2.

SPECIFICATION

Personal identification document and method of fabricating same

The present invention relates to improvements in electrographic methods of manufacturing substantially tamper-proof personal identification documents, and more particularly to improved procedures for the transfer of electrographic toner image in such methods.

There has long existed a need for documents which authenticate that a particular person is authorised for certain privileges, financial credits, passes, etc. To effect the desired purpose, that is assuring that only the authorized person engages in the document-authorized activities, the document should accomplish at least two things. Firstly, it should be substantially non-counterfeitable. Secondly, it should be readily identifiable by a monitoring agency as connected uniquely with the authorized document holder, and be substantially tamperproof with respect to alteration of this unique connective feature. In most instances a third necessity is that the document be producible at a reasonable cost.

There have been many approaches to achieving these objectives, increasing in complexity as new technologies evolved. Examples are the methods described in U K. Specification 1413832 and U.S Specification 4006050. However, just as the new technology is available to the document producer, so it is available to those who desire to use the documents without authority. Thus, there is continuing desire to provide better documents which more assuredly accomplish the above-mentioned objectives.

One recent approach which shows particular promise is to embed within the document detectable materials (e g., a magnetic material) forming a code pattern which is extremely difficult to duplicate. This sophisticated approach can accomplish the objective of substantial non-counterfeitability with respect to a number of similar cards. That is, they can be mass-produced in a central location, thus making per card costs feasible. There remains, however, the necessity to "tailor" each such document to the specific person who is authorised to use it. This would desirably be accomplished in a manner which is economical but achieves the tamper proof aspect mentioned above.

Photographs and signatures of the authorized individual, affixed to the card, are the most common means for accomplishing this purpose. However, signatures are fairly easily forged, and heretofore the techniques for affixing an individual's photograph to the non-counterfeitable core portion of the document have not substantially deterred the substitution of another individual's photograph.

It is therefore an object of the present invention to provide a method for electrographically manufacturing such person identification documents.

According to the present invention, there is provided a method of fabricating a person identification document which comprises electrographically producing a toner image containing visually verifiable features on a recording member, placing a thermoplastic cover sheet in contact with the image-bearing surface of the member, heating the member and sheet to effect transfer of the image to the sheet providing a core substrate, and laminating the substrate and the sheet together with the image therebetween.

The invention also provided a personal identification document comprising a core substrate, a transparent cover sheet of a thermoplastic material laminated thereto, and a toner image carried by the cover sheet sandwiched therebetween, the toner image having been transferred by heat to the cover sheet.

The invention will be described further, by way of example, with reference to the attached drawings which form a part thereof and in which

Figure 1 is a plan view of a core substrate and cover sheet formed in accordance with the present invention, but before lamination; and

Figure 2 is a side view illustrating means and method for effecting thermal transfer in accordance with a mode of the present invention.

Figure 1 schematically illustrates the component elements of a document formed according to the present invention. As shown, the personal identification document 10 comprises a core substrate 20 and a cover sheet 30

The illustrated core substrate comprises a matrix 21, which can be formed of suitable plastic material such as polyvinyl chloride or Estar film base and in which are embedded magnetic particles 22 in a predetermined code pattern. It is to be noted that the particular core substrate shown is merely exemplary and that the present invention is usable with many other types of core substrates. Usually the core substrate will be durable and contain some general document authenticating indicia. The core substrate itself can be a multilayer structure and the indicia can be selected for various types of physical or chemical verification. For example, the indicia can be optically or electronically detectable instead of magnetically. Thus, there are a wide variety of suitable core substrates already known in the art and others will undoubtedly be developed.

Referring now to cover sheet 30, this element is transparent or translucent and sized in correspondence to the core substrate surface to be covered thereby. In accordance with the illustrated embodiment of the invention, the cover sheet bears one or more toner images. These can include general informational data, such as the authorizing agency, and personal data, such as the individual's name or signature; however, the toner image 31 should include at least some visually-verifiable feature of the authorized person for whom the document is intended, for example, a toner image of the person's face or fingerprint.

There are a variety of known electrographic techniques by which such toner images can be formed. The most conventional involves the steps of uniformly charging a photoconductive insulator (photoconductor), exposing the photoconductor with a light pattern corresponding to the desired toner

image to form a latent electrostatic image and developing the electrostatic image with triboelectrically charged toner particles. However, procedures providing high resolution images are usually preferred. In this regard, it has been found particularly useful to use, for continuous tone areas of the image, such as the person's face, a pre-screened continuous tone original. Alternatively, an unscreened continuous tone portion of an original can be exposed through a conventional contact screen, e.g. a Kodak Magenta Contact Screen (Negative) 133 lines inch, onto the charged photoconductor.

Referring to Figure 2, there is schematically illustrated a toner transfer procedure according to the present invention which has been found to be particularly effective and useful in forming personal identification documents. This technique involves thermal transfer of the toner rather than electrostatic transfer and, as shown in Figure 2, can be effected utilizing a heating roller 40 and a cooling roller 41. The heating roller 40 has a silicone rubber peripheral coating denoted 42 and can be internally heated by conventional means (not shown). The cooling roller can be solid metal and has a thin Teflon coating 45. The rollers 40 and 41 desirably are urged together to provide a nip pressure e.g., in the range from about 1 to about 100 lbs linear inch. The heated roller surface temperature will depend on toner and cover sheet material utilized and the roller speeds; however, in general, roller temperatures can be in the range of from about 40 C to about 300 C or greater.

In operation, the photoconductor 50 and cover sheet 30 are placed in registry with the toner image therebetween and fed together into the nip of the rollers 40 and 41 so that the rear of the photoconductor contacts the heated roller 40. The outer surface of the cover sheet 30 thus contacts the cooling roller 41.

In accordance with the present invention, the cover sheet is formed of thermoplastic material which is heat-softenable to an extent that it encapsulates the toner contacting it. A desirable material is polyvinyl chloride polyvinyl acetate.

After passing through the rollers, the sandwich of photoconductor and cover sheet is allowed to cool to or near room temperature. Thereafter, the photoconductor is removed, leaving the thermally attached toner image on the cover sheet. With some cover sheet material it has been found particularly useful to provide a support (e.g., a paper sheet) for the cover sheet. Such support is fed through the rollers with the sandwich, between the cover sheet and the cooling roller. After cooling the support, if provided, can be removed from the cover sheet.

After separation from the photoconductor, the cover sheet 30, having the toner image attached, is in condition for lamination to the core substrate 20. This can be accomplished by placing the toner bearing surface of the cover sheet in registry with the core substrate 20 and feeding this composite unit between rollers 40 and 41 in the same manner as the transfer step but with cover sheet 30 contacting heated roller 40. This step laminates the cover sheet 30 to the core substrate 20 and also, depending on the nature of the toner material forming the image, preferably fuses this image to the core substrate.

Again it is sometimes useful to provide a support for the cover sheet, e.g. by placing a sheet of Estar (Estar is a Trade Mark) film between it and the heated roller. After cooling, the Estar (Estar is a Trade Mark) film sheet can be removed from the lamination.

In one specific example of practising the present invention, the rollers described above were 2 inches in diameter, having cover layer thickness of about 1·8 inch, a nip width of about 3 16 inch and a nip pressure of about 48 lbs linear inch. The thermoplastic cover sheet 30 and photoconductor were fed through the roller nip at the rate of about 1.6 cm sec with the heated roller at about 177 C. In comparing the amount of toner transferred by this procedure to electrostatic transfer procedures, it was remarkable to find that from about 85 to 90% of the toner was transferred using the thermal transfer technique compared to about 30% toner transferred using electrostatic procedures. This increase in transferred toner increased significantly the optical density of the final image in the identification document. Thereafter the cover sheet 30 bearing the toner image was laminated to the core substrate 20 as above described simultaneously fusing the toner image to the core substrate.

It will be appreciated that other apparatus different from those described above can be utilized in accordance with the present invention. For example a heated platen and a cooling platen, movable into pressure contact with the photoconductor and cover sheet therebetween could be substituted for the rollers. Other modified devices for effecting the transfer of toner with heat and pressure as taught herein will occur to those skilled in the art.

The invention has been described in detail with particular reference to certain preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the scope of the invention as defined in the appended claims.

CLAIMS

1. A method of fabricating a personal identification document which comprises electrographically producing a toner image containing visually verifiable features on a recording member, placing a thermoplastic cover sheet in contact with the image bearing surface of the member, heating the member and sheet to effect transfer of the image to the sheet, providing a core substrate, and laminating the substrate and the sheet together with the image therebetween.

2. A method as claimed in Claim 1 wherein the heating step comprises passing the recording member and cover sheet, in juxtaposition, between a pair of rollers, at least one of which is heated.

3. A method as claimed in Claim 2 wherein only one of the rollers is heated and the recording member is in contact with the heated roller during the passing step.

4. A method as claimed in Claim 2 or 3 wherein the rollers are urged toward each other to provide nip pressure on the portions of the sheet and member passing between the rollers.

5. A method as claimed in any of Claims 1 to 4 wherein laminating the cover sheet to the core substrate with the toner image therebetween is effected by passing the cover sheet and the substrate between rollers.

6. A method as claimed in Claim 5 wherein the lamination of the cover sheet to the core substrate is effected by heat, at least one of the rollers being heated.

7. A method as claimed in Claim 5 or 6 wherein the cover sheet is in contact with a heated roller during the laminating step.

8. A method as claimed in Claim 5, 6 or 7 wherein the rollers are urged toward each other to provide nip pressure on the portions of the sheet and substrate passing between the rollers during the laminating step.

9. A method of fabricating a personal identification document substantially as hereinbefore described with reference to the accompanying drawing.

10. A personal identification document comprising a core substrate, a transparent cover sheet of a thermoplastic material laminated thereto, and a toner image carried by the cover sheet sandwiched therebetween, the toner image having been transferred by heat to the cover sheet.

11. A document as claimed in Claim 11 wherein the toner image is encapsulated by the cover sheet.

12. A document as claimed in Claim 10 or 11 wherein the toner image is fused to the core substrate

13. A personal identification document substantially as hereinbefore described and formed by the method as claimed in Claim 1.

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